A Systematic Review of Teacher's Self-efficacy and Technology Integration

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Abstract
Technology integration in teaching and learning is one of the critical elements to be taken care of especially by the teacher. To start this, teachers need to have a self-efficacy. Previous literature always relates technology integration with self-efficacy either among teachers or students. In this review, the relationship between teacher's self-efficacy and technology integration has been examined. Besides, this review also examined the factors, related to teacher's self-efficacy in technology integration. Articles access from October 2017 until January 2018 across two databases ERIC and Google Scholar was referred to. Before starting the review, inclusion and exclusion criteria were performed. From this review, it was found that most of the studies presented result as there was a positive relationship between teacher's self-efficacy and technology integration. Factors such as playfulness, ease of use, effectiveness, and usefulness impacted teacher's self-efficacy in technology integration. Overall, this review has shown that teacher's self-efficacy was the central role of technology integration in teaching and learning.
Keywords: Self-efficacy, Teacher's Self-efficacy, Technology Integration, Technology Self-efficacy, Computer Self-efficacy

Introduction
Technology is something that very much needed by human nowadays. Due to this fact, one of the ways to widely integrate technology is from school. It is because school is where the process of learning starts and develops. Therefore, teachers need to consider using technology in teaching and learning. To make this a success, teachers play an essential role in integrating their content knowledge, pedagogical skills and technological skills in classrooms. It is in fact, in line with the framework of Technological Pedagogical Content Knowledge (TPACK) as a way of thinking about teachers' knowledge to understand technology integration effectively in classrooms (Koehler et al., 2013; Mishra & Koehler, 2006, 2008). Positive attitude to the role of technologies among teachers will help the effectiveness of technology integration in education (Kent & Giles, 2017). To fulfill this, teacher's personal and

professional technology self-efficacy and collective efficacy should be considered (Tilton & Hartnett, 2010). It can be said that self-efficacy plays a vital role of teachers to adopt technologies.

Therefore, it was extremely depends on individual's belief and ability to get a positive self-efficacy. Focused evidence of trial research and controlled field confirmed that our belief and ability contributed as unique as to the motivation and action (Bandura, 2009). Motivation and action are important elements for individual self-efficacy. It was because motivation increase individual self- efficacy to create an action that should be taken. Besides that, self-efficacy also depends on self-perception competency. Self-perception competency was an important aspect as people always overestimate or underestimate their ability and these estimations will show the consequence of their action and effort (Tschannen-Moran, Hoy, & Hoy, 1998). Sometimes it was good to overestimate as it give positive effect to our performance. This estimation also help individual to increase their self-efficacy. Individual self-efficacy is something that relates to believing so as an individual's strength.

Individual's strength that related to individual self-efficacy were influence by some sources. According to Usher and Pajares (2008), the most influence source of self-efficacy are mastery experience. Mastery experience were something that will give motivation to individual and make them take an action. The strength of the individual is an important part of a causal structure that affects the function of individual either directly or indirectly through important determinant class (Bandura, 2009). The determinant class is a factor that impacts every self-efficacy; determinant class is aimed aspiration, an incentive that comes from the result, perceived impediment and structure opportunity in the social system (Bandura, 2009). However, the strength and influence source are different from contextual factor (gender, ethnicity, academic ability and academic domain) (Usher & Pajares, 2008).

Although the strength and influence source are different from contextual factor, it was a part that mediate vicarious experience of self-efficacy (Usher & Pajares, 2008). Therefore, self-efficacy could be related to any field in which in this review, it was related to technology integration. Technology integration is undoubtedly one of the essential aspects of teaching and learning. Research on technology integration in teaching and learning usually work hand in hand with teachers, either in-service or pre-service teacher. The understanding of pre-service teachers' beliefs that influences their ability to integrate technology into their practices successfully has been stated in Bandura's (1977) Theory. Thus, these two areas of research will provide a unique connection between both of them. It has also been agreed by Abbit (2011) who conducted research among pre-service teachers that explained the nature of the relationship between technology integration and self-efficacy belief.

To examine the connection between self-efficacy and technology integration in teaching and learning, researches have been completed in the psychological aspects either from teachers' perception (Gebremedhin & Fenta, 2015; Spaulding, 2013), relationship of self-efficacy and technology (Kazan & ELDaou, 2016; Letwinsky, 2017; Raphael & Mtebe, 2017), scale measurement (Akman & Guven, 2015; Bilici et al., 2013; Fanni et al., 2013; Simsek & Yazar, 2016; Teo & Koh, 2010), teacher preparedness (Cahyono & Mutiaraningrum, 2016; Hayes, 2011; Magliaro & Ezeife, 2007; Thorsteinsson, 2013a), and contributing factors (Brinkerhoff, 2006; Chou et al., 2010; El-daou, 2016; Gilakjani, 2013; Jung, 2015; Pilten et al., 2017; Stewart et al., 2013; Unal et al., 2017; Vannatta & Fordham, 2004; Vavasseur & MacGregor, 2008; Zagumny et al., 1999).

The goal of this review was to synthesize results of studies that examined the relationship between teacher's self-efficacy and technology integration, and the factors that

contributed to the teacher's self-efficacy in technology integration. First, the researchers defined the technology integration as any technology, used in teaching and learning processes. Then, the researchers followed the description of teacher's self-efficacy and the way it related to technology integration. To determine which appropriate studies to review, the researchers built two research questions that relevant to what we want in education aspect which were: a) What is the relationship between teacher's self-efficacy and technology integration?; and b) What is the factor that contributes to the teacher's self-efficacy in technology integration?. These questions guided and steered our decision to choose the best studies to be included in this review. After reviewing the studies, the researchers synthesized the results to answer both questions.

Self-Efficacy

The definition proposed by Social Cognitive Theory from Bandura (1977) on individual self-efficacy had been used by authors as a guideline when review all the articles selected. This theory defined self-efficacy as an expectation on attitudes and effort to do or experiences some work. Besides, as cognitively, self-efficacy was a belief on behavior ability and social skills when doing some task (Bandura, 1994). The authors also used definition by teacher's self-efficacy from Tschannen-Moran, Hoy, and Hoy (1998) as a guideline too. Tschannen-Moran, Hoy, and Hoy (1998) had defined teacher's self-efficacy as a reflection of their teaching experience either success or failure besides their belief in their ability. Therefore, as a guideline, the author's defined teacher's self-efficacy in technology integration as teacher's belief on their ability when using technology in teaching and learning when review all the articles related.

Bandura (1977) describes self-efficacy as individual's belief on his or her ability to organize and execute the action to attain goods. This belief influences many aspects of behavior that is the choice of action, amount and duration of effort and emotional response to success (Bandura, 1977). The action taken is based on individual's ability, how long an attempt should be put in and how the individual manages emotional to succeed. That means Self-Efficacy Theory suggests the belief that concerns of one's ability that effects desired outcomes of thought and action (Abbit, 2011). The higher self-efficacy will produce a positive aura to support efforts, whereas, the lower self-efficacy affects decisions to continue the effort.

Thus, self-efficacy is needed mainly to support teachers regarding technology integration in teaching and learning. This is due to the reason that there will be multiple domains of self-efficacy in teacher's thought and action when integrating technology in class. This self-efficacy should be standardized with teacher's technology knowledge. According to Mishra and Koehler (2006) in their framework of Technology Pedagogy Content Knowledge (TPACK) for teachers, technology knowledge among teachers was one of significant expertise among other expertise. Therefore, the standardization between self-efficacy and technology integration helps teachers to have excellent learning and teaching sessions.

Self-efficacy and technology integration were vast emphases in researchers. Various factors have been put to the tests to relate self-efficacy and technology integration such as goal setting and learning experiences (Abbitt & Klett, 2007; Ryang, 2002; Tilton & Hartnett, 2010; Unal et al., 2017) Other than that, TPACK competency was also being measured in this area (Alshehri, 2012; Baris, 2015; Keser et al., 2015). Professional development offers a positive impact on teacher's self-efficacy and technology integration (Brinkerhoff, 2006; Stevens et al., 2013; Swackhamer et al., 2009; Umar & Hassan, 2015; Unal et al., 2017). Results

of this area also demonstrated a positive attitude to ICT and performance (Alshehri, 2012; Kazan & ELDaou, 2016; Unal et al., 2017). Furthermore, Hayes (2011) and Magliaro and Ezeife (2007) discovered that self-efficacy and technology integration were also related to preparedness. Based on previous researchers, it was clear that self-efficacy and technology integration has been conceptualized as an important aspect of education.

Method

According to Hart (1998), when doing a literature review, information could be accessed through electronic media and hard copy. In this study, the review and analysis were performed using electronic media which was two electronic databases namely Eric and Google Scholar, conducted between October 2017 and January 2018. There were five phases from Khan et al. (2003) being used in this review. The phases were as illustrated in Figure 1.
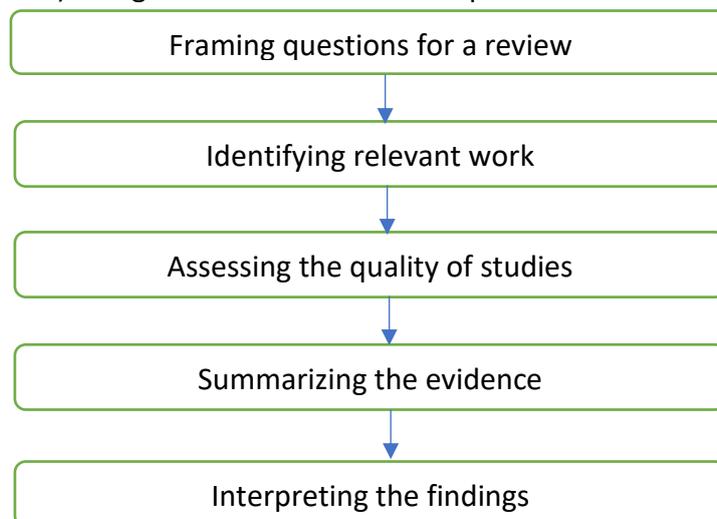

Figure 1. Phase of Systematic Literature Review

Phase 1: Framing questions for a review

Before starting a review of a study, firstly, questions should be framed. In this review, there were two questions. The selected studies for this review were studying that examined the relationship between teacher's self-efficacy and technology integration and factors contributing to teacher's self-efficacy in technology integration. Technology integration was defined as any technological base, used by teachers in class or laboratory such as multimedia, web-based learning, and database.

Phase 2: Identifying relevant work

The search for this review included two critical phases: (a) collecting all related articles based on initial search and (b) choosing articles of initial search based on inclusion and exclusion criteria for this review. ERIC and Google Scholar databases were exploited to search the relevant article in the first phase. The articles were limited in the range of 20 years that were between 1999 until 2018. When searching for this article was based on the initial search in which limiters were applied so that the most relevant articles would be identified. The limiters were English, peer review, and full-text article. The following keywords were employed in this search: "self-efficacy" AND "technology integration"; "computer self-efficacy" AND "technology integration"; "technology self-efficacy" AND "technology integration"; "computer self-efficacy" and "technology self-efficacy".

Phase 3: Assessing the quality of studies

Inclusion and exclusion criteria were utilized to assess the quality of this review. Inclusion criteria were used to identify studies that would be included in this review after an initial selection of articles. Kitchenham (2004) stated that for accessing each potential primary study, the definition of study, inclusion, and exclusion criteria were required. The criteria focused on research questions, methodology and results. For exclusion criteria in the first phase of the search, dissertations, chapters, technical report, proceeding less than 3 articles related to the study were excluded, but only articles related and yielded the limiters were included.

First and foremost, if the studies examined these two questions, it would be included in this review; which was: a) What is the relationship between teacher's self-efficacy and technology integration? b) What is the factor that contributes to the teacher's self-efficacy in technology integration? The rationale lingered this two questions, based on previous researched that studied self-efficacy classroom set. It was also agreed by Bandura (1994) that scrutinized the conceptualization of self-efficacy and various factors related to self-efficacy. In addition, teacher's self-efficacy has a relationship to technology integration as it influences teacher's intention to use technology in their lesson (Alhassan, 2017; Kazan & ELDaou, 2016; Letwinsky, 2017). Thus, studies that identified the relationship between teacher's self-efficacy and technology integration and factors contributing to the teacher's self-efficacy in technology integration were included in this review. A study that identified issues outside of this theme framework were excluded.

Secondly, to be included in this review, the studies were needed to clarify theoretical framework that measured teacher's self-efficacy. As an example, studies that measured self-efficacy using Bandura's (1977) Theory as the underlying theory was included in this review. On the other hand, studies that did not clearly clarify the theoretical framework were excluded. Thirdly, for methodology, either the studies were quantitative or qualitative they will be included in this review as long as they made use of either in-service or pre-service teacher as samples or respondents. If samples or respondents were other than that, the studies will be excluded. Lastly, the most important part was the studies needed to discuss their findings clearly as the researchers required to analyze the findings according to prior questions.

Phase 4: Summarizing the Evidence

As stated before, this review did not focus on specific tools that had been used for technology integration. Thus, the keyword in searching procedures was aimed to collect any studies examined the relationship between teacher's self-efficacy and technology integration and the factors that contributed to the teacher's self-efficacy in technology integration. As the first step of searching articles, there were 169 articles to be screened for inclusion criteria that were peer-reviewed and full-text articles. 35 duplicate studies that have found were removed. With that remaining number of articles, the other inclusion and exclusion criteria such as not refer to in-service or pre-service teachers and technology were used to choose articles that will be included in this review. Dissertations, chapters, review paper, proceeding less than 3 related articles were excluded from this review as well. Out of 169 articles found in the first step, finally, 71 articles were confirmed to be used in this review. It can summarize the details of the searching process using the PRISMA flows chart as shown in Figure 2.
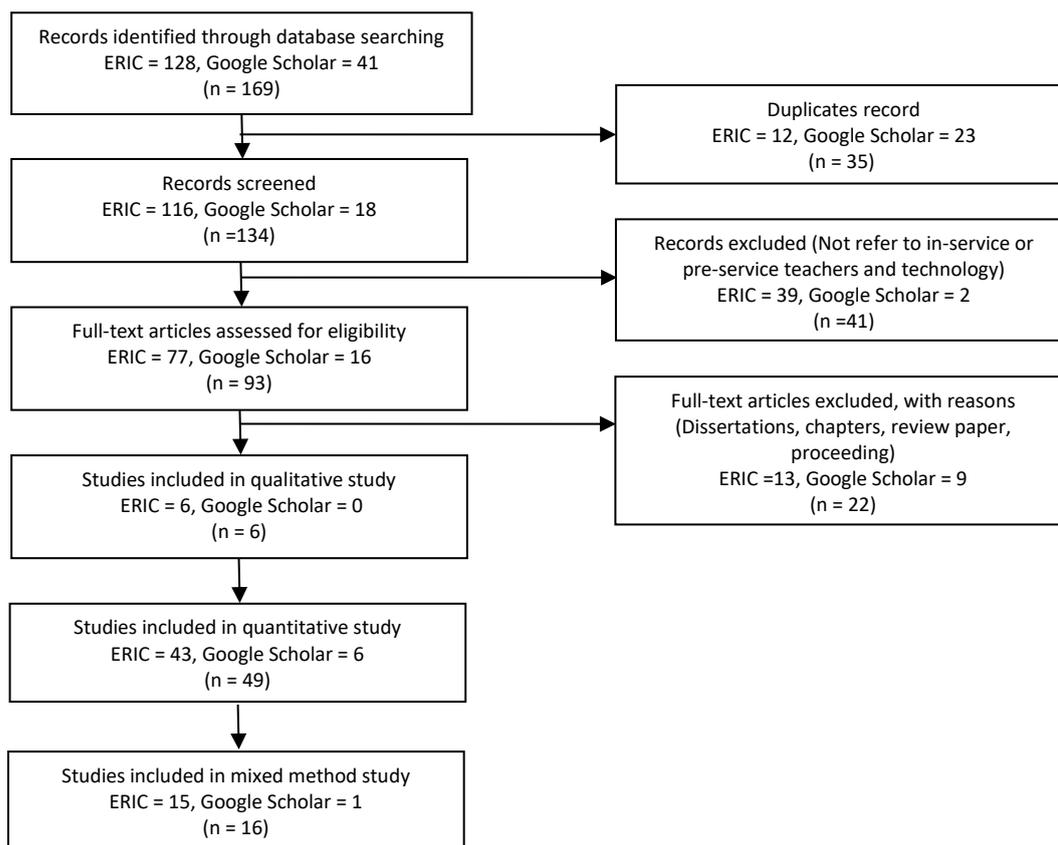
Figure 2. PRISMA Flows Chart

Phase 5: Interpreting the findings

Based on questions that the researchers had created, these 71 articles were grouped into two. The groups were according to the research questions that have been stated before. Most of the studies that had been reviewed were quantitative study. There were 49 quantitative studies, 6 qualitative studies and 16 mixed method studies There were 18 out of 71 articles examined the relationship between teacher's self-efficacy and technology integration, whereas, only 1 out of 71 articles examined factors contributing to teacher's self-efficacy in technology integration. However, there were 35 out of 71 articles examined both aspects and 17 out of 71 articles not examined both aspects. This group represented the important input of this review. Thus, in the following section, the analyses were addressed according to the groups based on research questions aim and method of study. Research question 1 refers to the relationship between teacher's self-efficacy and technology integration and research question 2 refer to factors that contributed to teacher's self-efficacy in technology integration. Meanwhile, both research questions refer to studies that examined research question 1 and 2 and none means studies not examined both research questions. The analyses were as shown in Table 1.

Table 1

Numbers of Study Based on Research Questions and Methods

Methods	Research Question 1	Research Question 2	Both Research Questions	None
Quantitative study	12	0	29	8
Qualitative study	2	0	1	3
Mixed method study	4	1	5	6

The participant of all the reviewed studies was teachers either they were in-service or pre-service teachers. As the studies aimed at teachers, the sampling technique that mostly uses for all the studies was random sampling and convenience sampling. Most of the location of this study also was in school either primary or secondary school but there were also studies that were doing in teacher training institution and university (faculty of education/education programme) especially that involve pre-service teachers.

Results

The relationship between teacher's self-efficacy and technology integration

The findings of past studies relating to the relationship between teacher's self-efficacy and technology integration were examined in this section. For this question, the studies were divided into three methodology categories: a) Quantitative Study, b) Qualitative Study and c) Mixed Method Study. The complete list of studies based on this three method categories was as shown in Table 2.

Table 2

List of Reviewed Studies of Relationship between Teacher's Self-efficacy and Technology Integration

Methods	Author (Year)
Quantitative study, n = 12	Abbitt (2011)
	Chen (2012)
	Derya (2015)
	Efe & Efe (2016)
	El-Daou (2016)
	Gulten, Yaman, Deringol, & Ozsari (2011)
	Kent & Giles (2017)
	Park & Ertmer (2007)
	Sahin, Celik, Akturk, & Aydin (2013)
	Topkaya (2010)
	Williams (2008)
	Winslow, Dickerson, Cheng, & Geer (2012)
Qualitative study, n = 2	Thorsteinsson (2013a)
	Thorsteinsson (2013b)
Mixed method study, n = 4	Gebremedhin & Fenta (2015)
	Fanni et al. (2013)
	Magliaro & Ezeife (2007)

<div align="center">Pilten et al. (2017)</div>

Overall, it proved that to examine a relationship between teacher's self-efficacy and technology integration, most of the studies used a quantitative method. Relatively, most of the studies examined the relationship between teacher's self-efficacy and technology integration and they presented positive results. The studies were examined among in-service and pre-service teacher. There was also a study that examined teacher's self-efficacy from the school administrator view (Winslow et al., 2012). Usually, the studies relating to teacher's self-efficacy with some others factors such as knowledge (Galvis, 2012; Lin & Lu, 2010), professional development (Brinkerhoff, 2006; Chien Pan & Franklin, 2011; Lailiyah & Cahyono, 2017; Vannatta & Fordham, 2004), teachers' intention (Fokides, 2017), attitudes (Gloria & Oluwadara, 2016; Holden & Rada, 2011; S. Y. Kim & Kim, 2013; Letwinsky, 2017), performance (El-daou, 2016), TPACK (Abbitt, 2011; Kazu & Erten, 2014; Keser et al., 2015; Sahin et al., 2013; Stewart et al., 2013), experience (Banas & York, 2014; Lailiyah & Cahyono, 2017; Sarfo, Amankwah, & Konin, 2017; Tilton & Hartnett, 2010) and others that influenced their positive relationship with technology integration. All of these factors were mediating between teacher's self-efficacy and technology integration. But then, there were also studying that believed self-efficacy was not effective against teachers in technology integration (Aypay et al., 2012). As an example, the study stated that computer self-efficacy had a negative effect on behavioral intention. It means that self-efficacy did not give the effect of the teacher intention in integrating technology.

Factor contributes to the teacher's self-efficacy in technology integration
The findings of past studies relating to the factors that contributed to the teacher's self-efficacy in technology integration were examined in this section. For this question, the studies were divided according to either they were only examining one research question, or examined both; the relationship of self-efficacy and factor contributed to teacher's self-efficacy in technology integration. There were 35 studies that examined both relationship and factor, but there was a study that only examined factors contributing to teachers' self-efficacy in technology integration. The study that only examined factors was by Park and Ertmer (2007) that investigated the potential of problem-based learning which influenced teachers' belief in technology integration and the results bestowed positive impacts to pre-service teachers' belief. The complete list of studies that examine both; the relationship of self-efficacy and factor contributed to teacher's self-efficacy in technology integration were as shown in Table 3.

Table 3

List of Reviewed Studies of Relationship of Self-Efficacy and Factor Contributed to Teacher's Self-Efficacy in Technology Integration

Methods	Author (Year)
Quantitative study, n = 29	Abbitt & Klett (2007)
	Adalier (2012)
	Alhassan (2017)
	Asing-Casgman, Gurung, Limbu, & Rutledge (2014)
	Awofala, Akinoso, & Fatade (2017)
	Aypay, Celik, Aypay, & Sever (2012)
	Banas & York (2014)
	Brinkerhoff (2006)
	Chien Pan & Franklin (2011)
	Chou, Hsiao, Shen, & Chen (2010)
	Fokides (2017)
	Gloria & Oluwadara (2016)
	Govender & Govender (2009)
	Hayes (2011)
	Holden & Rada (2011)
	Jung (2015)
	Kazu & Erten (2014)
	Keser, Yilmaz, & Yılmaz (2015)
	H. J. Kim & Jang (2015)
	S. Y. Kim & Kim (2013)
	Letwinsky (2017)
	Lin & Lu (2010)
	Raphael & Mtebe (2017)
	Sarfo, Amankwah, & Konin (2017)
	Stewart, Antonenko, Robinson, & Mwavita (2013)
	Teo (2009)
	Unal, Yamac, & Uzun (2017)
	Vannatta & Fordham (2004)
	Zagumny, Zagumny, & Littrell (1999)
Qualitative study, n = 1	Tilton & Hartnett (2010)
Mixed method study, n = 5	Kazan & ELDaou (2016)
	Lailiyah & Cahyono (2017)
	Li, Worch, Zhou, & Aguiton (2015)
	Turel (2014)
	Vavasseur & MacGregor (2008)

Although most of the studies that examined the relationship between teacher's self-efficacy and technology integration have related them with some factors, there were only a few studies that truly investigated factors contributing to the teacher's self-efficacy in technology integration. One of the studies was from Chou et al. (2010) that analyzed factors of computer self-efficacy of technological and vocational school teachers and its finding

validated four factors; playfulness, ease of use, effectiveness, and usefulness. According to Chou et al. (2010), as the study conducted a model, the factors of computer self-efficacy and organizational climate had fit a model for technological and vocational school teachers on continuous usage of e-teaching. This four-factor is usually used as it related to Technology Acceptance Model. If teachers accept technology to be used in teaching and learning, their self-efficacy also will be affected. Studies from Aypay et al. (2012); Fokides (2017); Jung (2015) and Raphael and Mtebe (2017) use the same factors such as perceived usefulness and perceive ease of use to examined teacher's self-efficacy in technology integration. The results of the studies show that the factor give positive effect to teacher's self-efficacy in technology integration but a study from (Awofala et al., 2017) stated that perceived usefulness and perceived control was not a factor for teacher's self-efficacy in technology integration. Besides, others factor such as individual (knowledge, capacity, motives) and environment (information, resources, incentives) also being used to examine teacher's self-efficacy in technology integration (Lin & Lu, 2010). It shows that all the factor that related to teacher's self-efficacy in technology integration were something that relates to behavioral and psychological aspect either it relates to individual or technology.

Discussion

The discussion was prepared accordingly for theoretical and methodological issues. The findings of all studies that are reviewed had granted informative inputs together with several theoretical issues, found in this line of research. For the theory of self-efficacy, most studies were argued based on Social Cognitive Theory of Bandura. The studies from Abbitt (2011); Awofala et al. (2017); Chou et al. (2010); Govender & Govender (2009); Fanni et al. (2013); Lee & Ertmer (2006); Letwinsky (2017); Li et al. (2015); Magliaro & Ezeife (2007); Maigo & Mei-yan (2010); Sahin et al. (2013); Teo & Koh (2010); Thorsteinsson (2013a, 2013b); Turel (2014) and Zagumny et al. (1999) had observed Social Cognitive Theory of Bandura as individual's self-efficacy but not specifically as teachers' self-efficacy. Only two studies from Ünal et al. (2017) and Alhassan (2017) investigated self-efficacy using other theories about teacher's self-efficacy that was from Ashton and Pajares. Meanwhile, the studies from Chien PAN & Franklin (2011); El-daou (2016); Hayes (2011); Karaarslan & Sungur (2011); Kent & Giles (2017); Kiili, C., Kauppinen, M., Coiro, J., & Utriainen (2016); Kim (2013); Overbaugh & Lu (2008); Park & Ertmer (2007); Sarfo et al. (2017); Stewart et al. (2013); Tilton & Hartnett (2010) and Vavasseur & MacGregor (2008) had combined Social Cognitive Theory by Bandura with others teacher's self-efficacy such as from Ashton, Pajares, Gibson and Dembo, and Tschannen Moran.

Besides, for technology integration, the studies by Al-Azawei et al. (2017); Asing-Casgman et al. (2014); Brinkerhoff (2006); Fokides (2017); Holden & Rada (2011) and Jung (2015) using Technology Acceptance Model as the major theory. There were also studies by Wanjala (2016) and Williams (2008) that employed Diffusion Theory for technology integration. Most of the studies discussed technology integration without wholly using the respective theory as they only wanted to relate it with self-efficacy. The studies provided more attention to the Self-Efficacy Theory.

In methodological, issues can be captured depending on the method, used in the study. They were about 49 out of 71 studies exploited a quantitative method, 16 out of 71 studies employed a mixed method, and 6 out of 71 studies exercised a qualitative method. Therefore, it can be summarized that most of the studies made use of a quantitative method. This was due to the fact that the past researchers discovered the relationship between self-

efficacy and technology integration among variables that had been stated. According to Creswell (2009), when investigating the relationship between variables, a quantitative method was the most preferably to be used among social science researchers.

From the technology aspect, mind tools have been used for teaching and learning sessions by teachers. Mindtools were aid kits that help in stimulating thinking (Slangen & Sloep, 2005) such as hypermedia, graphics, audio, video, text, web and hyperlink. Although mind tools do not make learning easier, they have made it better and it has been shown that this type of tools was suitable for teaching and learning.

Conclusion and Future Research

The studies highlighted in this review examined two issues related to the relationship between teacher's self-efficacy and technology integration and the factors that contributed to the teacher's self-efficacy in technology integration. First, most of the studies stated there was a positive relationship between teacher's self-efficacy and technology integration. It shows that self-efficacy was a behavioral and psychological factor that can be related with teachers intention when they integrated technology in teaching and learning (Alenezi, Abdul Karim, & Veloo, 2010). Meanwhile, the factors that contributed to teacher's self-efficacy were variable that always been discussed when the study examined the relationship between teacher's self-efficacy and technology integration. Usually, all the factors discussed were a cognitive factor of self-efficacy and technology integration (Coknaz & Aktag, 2017). Therefore, for future study, it is need to clarify affective factors between self-efficacy and technology integration.

Basically, from all the studies that were reviewed, self-efficacy has been recognized as an element that facilitates and provides impact when it comes for teachers to integrate technology in teaching and learning even though it needs to improve all the factors relating to self-efficacy. Teachers can manage their self-efficacy as the factors have been recognized. All the recognized factors should be taken care of by teacher as they are the ones that will integrate technology into classrooms. Therefore, to make teaching and learning more to excite with technology, it should be started by a teacher's high self-efficacy and teacher's self-efficacy should be known deeply.

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